DOCUMENT RESUME

ED 380 309 SE 056 126

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TITLE Making Mathematical Connections in Middle School. ERIC Digest.
INSTITUTION ERIC Clearinghouse for Science, Mathematics, and Environmental Education, Columbus, Ohio.
SPONS AGENCY Office of Educational Research and Improvement (ED), Washington, DC.
REPORT NO EDO-SE-95-5
PUB DATE 95
CONTRACT RR93002013
NOTE 4p.; For related digests, see SE 056 125-127.
AVAILABLE FROM ERIC/CSMEE, 1929 Kenny Road, Columbus, OH 43210-1080 (single copies free).
PUB TYPE Guides - Classroom Use - Teaching Guides (For Teacher) (052) -- Information Analyses - ERIC Clearinghouse Products (071)

EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS Art Activities; *Integrated Activities; *Interdisciplinary Approach; Intermediate Grades; Junior High Schools; *Learning Activities; *Mathematics Instruction; *Middle Schools; Science Activities; Social Studies; Thematic Approach; Vocational Education; Writing Across the Curriculum
IDENTIFIERS *Connections (Mathematics); ERIC Digests; Language across the Curriculum; Mathematics Activities

ABSTRACT

Of all the reform recommendations being made by the National Council of Teachers of Mathematics, making mathematical connections is among the more difficult, yet most important to achieve, especially at the middle school level, where students are first beginning to appreciate the real power of mathematics. Mathematical connections can relate mathematical topics to students' daily lives and to other mathematical topics but are probably most important in relating mathematics to other curriculum areas. These connections help students understand mathematics better and see it as a useful and interesting subject to study. This digest gives 17 sample activities appropriate for use in middle school classes to connect mathematics to other subjects. It is organized into the following subject headings: language arts, science, social studies, arts, thematic units, and vocational. (MKR)

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Making Mathematical Connections in Middle School

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ERIC CSMEE Digest

Clearinghouse for Science, Mathematics, and Environmental Education EDO-SE-95-5 April 1995

Making Mathematical Connections in Middle School

Michelle K. Reed

Of all of the reform recommendations being made by the National Council of Teachers of Mathematics, making mathematical connections is among the more difficult, yet most important, to achieve, especially at the middle school level, where students are first beginning to appreciate the real power of mathematics. Mathematical connections can relate mathematical topics to students' daily lives and to other mathematical topics but are probably most helpful in relating mathematics to other curriculum areas. These connections help students understand mathematics better and see it as a useful and interesting subject to study.

This digest gives samples of activities appropriate for use in middle school classes to connect mathematics to other subjects. Resources are listed by subject area and are drawn from a longer annotated bibliography of mathematical connections available from ERIC/CSMEE (see end note).

Language Arts

"Comparing Raisins: A Lesson With Fifth Graders (Writing in Math Class)" describes an activity in which fifth-grade students solved a problem and wrote a convincing argument to prove their solution made sense.

Burns, M. (1993, November-December). Comparing raisins: A lesson with fifth graders (Writing in math class). *Writing Notebook: Visions for Learning, 11*(2), 40-41.

"A Language Arts Approach to Mathematics" proposes the use of literature to introduce new mathematical concepts. Presents a story to develop the concept of grouping, and follows with 11 activities related to the story in which students use dramatization and manipulative materials to develop new groupings, predict outcomes, validate their predictions, and discuss findings, all directed toward developing the concept of place value.

Nevin, M. L. (1992, November). A language arts approach to mathematics. *Arithmetic Teacher, 40*(3), 142-146.

"The Mathematics–Children's-Literature Connection" describes three types of children's books for use in developing mathematical concepts. Discusses the characteristics of a good mathematical concept book, methods of incorporating reading into mathematics class, and three examples of children's mathematical concept books. Includes a bibliography of 159 children's trade books selected for integrating into mathematics instruction.

Gailey, S. K. (1993, January). The mathematics–children's-literature connection. *Arithmetic Teacher, 40*(5), 258-261.

Using story writing to teach math gives students a chance to play with mathematical processes in a low-pressure way. By encouraging students to apply mathematical concepts within a narrative, teachers can see how well students understand the concepts. **"Use the Muses for Math: Five Story-Making Activities That Boost Kids' Math Skills"** presents five story-making activities to enhance mathematics skills.

Gregory, C. (1994, April). Use the muses for math: Five story-making activities that boost kids' math skills. *Instructor, 103*(8), 30-31.

Science

"Analyzing Energy and Resource Problems: An Interdisciplinary Approach to Mathematical Modeling" suggests ways in which mathematical models can be presented and developed in the classroom to promote discussion, analysis, and understanding of issues related to energy consumption. Five problems deal with past trends and future projections of availability of a nonrenewable resource—natural gas.

Fishman, J. (1993, November). Analyzing energy and resource problems: An interdisciplinary approach to mathematical modeling. *Mathematics Teacher, 86*(8), 628-633.

"IDEAS" presents activities that focus on gathering, using, and interpreting data about fingerprints as a basis for integrating mathematics and science. Patterns, classification, logical reasoning, and mathematical relationships are explored by making graphs, classifying fingerprints, and matching identical fingerprints. A parent-involvement activity sheet is included.

Young, S. L. (1991, March). IDEAS. *Arithmetic Teacher, 38*(7), 24-33.

"A Look at Project AIMS" describes features and offerings of Project AIMS (Activities Integrating Mathematics and Science) that rely on materials developed and written by teachers and use inexpensive, easily acquired equipment and supplies. The focus is on hands-on mathematics and science. Includes a brief critique of the program.

Deal, D. (1994, January). A look at Project AIMS. *School Science and Mathematics, 94*(1), 11-14.

"SSmiles" presents activities to supplement lessons on length and mass measurement or as part of a unit on atoms or orders of magnitude. Provides a lesson plan using aluminum foil to estimate unit measures, calculate the foil's thickness, and do an atom count.

Sunal, D. W., & Tracy, D. M. (Eds.). (1992, January). SSmiles. *School Science and Mathematics, 92*(1), 40-44.

Social Studies

"Decimals, Rounding, and Apportionment" discusses four historical methods by which seats in the House of Representatives are apportioned and the ways these methods can be used to reinforce operations involving decimal fractions and different rounding procedures.

Meeks, K. I. (1992, October). Decimals, rounding, and apportionment. *Mathematics Teacher, 85*(7), 523-525.

"Old Glory: A Practical Investigation Into Pattern" suggests that there has been sufficient interest in the changing arrangements of stars in the flag of the United States over the years to introduce a mathematical investigation into the various possible patterns of stars.

Selkirk, K. (1992, March). Old glory: A practical investigation into pattern. *Mathematics in School, 21*(2), 42-45.

"Taking Multicultural Math Seriously: Perspectives" asserts that social mathematics,

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taught with a multicultural focus, provides opportunities to help children learn about cultural pluralism. Includes three class activities that require students to analyze and interpret numerical data about immigration and the ethnic composition of the United States.

Shaw, C. C. (1993, September-October). Taking multicultural math seriously: Perspectives. *Social Studies and the Young Learner*, 6(1), 31-32.

"Using Biographies to Humanize the Mathematics Class" suggests three methods of introducing biographies of mathematicians into the classroom. Includes discussion and examples of the methods and lists birthdays of over 120 mathematicians. The bibliography lists books written on various reading levels and includes five books devoted to women mathematicians.

Vodlich, E. D. (1993, September). Using biographies to humanize the mathematics class. *Arithmetic Teacher*, *41*(1), 16-19.

Arts

Creative Learning Experiences in Math: Resource Guide 8 emphasizes the areas of elementary level mathematics, architecture, and visual arts, with secondary emphasis on language arts and creative writing. The major goals are to develop an understanding of how the arts can enhance mathematical concepts, to describe mathematical qualities through the application of the arts, and to develop a sensitivity to the everyday uses of artistic forms in converting mathematical concepts into aesthetically pleasing concrete forms. Lesson plans are grouped into the areas of: (1) Measurement, Form, Shape, and Building Models; (2) Math in Art and Poetry; (3) Computation; (4) Patterns and Shapes; (5) Descriptive Data; and (6) Graphing.

Lee, R. T. (Ed.). (1989). *Creative learning experiences in math: Resource guide 8*. Albany: New York State Department of Education. (Originally developed through the Arts in Education Program of the Plainedge Public Schools, Bethpage, NY. Also sponsored by the New York Foundation for the Arts). (ED 308 079)

"IDEAS" presents five activities for the family and K-2, 3-4, 5-6, and 7-8 levels that focus on the connections between mathematics and music. Activities examine the mathematical concepts of counting, estimation, measurement, statistics, fractions, and patterns involved in rhythm, beats in a measure, music preference, the musical scale, and radio music selection. Includes reproducible worksheets.

Moses, B. E., & Proudfit, L. (1992, December). IDEAS. *Arithmetic Teacher*, *40*(4), 215-225.

Thematic Units

Having a garden in the classroom offers students a chance to explore plant life cycles, and provides a hands-on context for teaching a wide variety of basic subject area skills in science, mathematics, social studies, language arts, health, and fine arts. ***GrowLab: A Complete Guide to Gardening in the Classroom*** is designed to help teachers in grades K-8 establish and maintain a garden in their classroom. Chapter topics include setting up, choosing fluorescent tubes and containers, planting and transplanting, maintaining a healthy environment, controlling pests, preparing the garden for a long vacation, troubleshooting, cleaning and storing equipment, and building enthusiasm within the school and community. Additional suggestions for developing curriculum activities, lessons, and experiments are also provided. Appendices contain reproducible activity worksheets, a list of yearly supplies, instructions for building a grow lab, and an annotated reference section that lists books, audiovisual materials, organizational resources, and suppliers of gardening equipment and seeds.

Pranis, E., & Hale, J. (1991). *GrowLab: A complete guide to gardening in the classroom*. Burlington, VT: National Gardening Association (180 Flynn Avenue, Burlington, VT 05401). (ED 366 512)

Learn & Play Olympic Sports: Curriculum Guide for Teachers, Grades 3, 4, and 5 features lesson plans that focus on the Olympic Games. The guide is part of a larger program sponsored by the Amateur Athletic Foundation of Los Angeles that is targeted at Southern California students, ages 8-10, who were born just before or after the 1984 Los Angeles Olympic Games. Lesson plans incorporate the disciplines of mathematics, geography, language arts, science, social studies, and physical education. Examples are: "Learning Geography Through the Olympic Flame Route" (geography) and "Calculating Calories and Energy Spent in Exercise" (mathematics).

Moore, C. (1992). *Learn & play Olympic sports: Curriculum guide for teachers, grades 3, 4, and 5*. Los Angeles: Amateur Athletic Foundation of Los Angeles. (ED 356 167)

Vocational

The Middle School Exploratory Vocational Wheel presents eight models of the exploratory vocational wheel for middle and junior high school and a collection of career development activities designed for infusion in various curriculum areas. The wheel is a scheduling strategy that allows middle school students to explore elements of several different occupations as classes rotate from course to course, forming the basis for more in-depth learning when students choose full courses of interest to them. Introductory material explains various configurations of the wheel, and diagrams illustrate eight models. Lesson plans for the career development activities or "best practices" that follow are divided into five subject areas: science, social studies, mathematics, miscellaneous courses (fine arts, student services, vocational education), and language arts. Appendices list program course standards for six wheels, major concepts/content, laboratory activities, special notes, and intended outcomes for each.

Florida State Department of Education. (1990). *The middle school exploratory vocational wheel*. Tallahassee: Division of Vocational, Adult, and Community Education (Bureau of Career Development and Educational Improvement, Florida Education Center, Tallahassee, FL 32399-0400). (ED 357 285)

"Real-Life Business Math at Enterprise Village" presents a program to introduce fifth graders to everyday economic life by constructing a true-to-life simulation of an economic community. Students apply mathematical skills to managing a checking account, calculating electric bills, and managing shops using computers.

Esty, W. W. (1991, December). Real-life business math at Enterprise Village. *Arithmetic Teacher*, *39*(4), 10-14.

Note

The items listed above are drawn from a longer annotated bibliography of mathematical connections available for $1.95 from ERIC/CSMEE, 1929 Kenny Road, Columbus, OH 43210-1080. For a complete list of publications in mathematics, science, and environmental education available from ERIC/CSMEE, call 1-800-276-0462.

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OERI This digest was funded by the Office of Educational Research and Improvement, U.S. Department of Education under contract no. RR-93002013. Opinions expressed in this digest do not necessarily reflect the positions or policies of OERI or the Department of Education.

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